

Applicatioin No. 10/666,211
Amendment dated April 8, 2005
Reply to Office Action of January 12, 2005

Docket No. 1232-5161

Amendments to the Drawings:

The attached sheet of drawing includes changes made to Fig. 19. This sheet replaces the original sheet including Figs. 18 and 19. Fig. 19 is labeled as -- PRIOR ART --.

Attachment: Replacement Sheet

REMARKS

Applicants respectfully request reconsideration of this application in view of the foregoing amendment and following remarks.

Objection

The Office Action indicates that Fig. 19 should be designated as prior art.

Fig. 19 has been revised to be designated as -- PRIOR ART -- as indicated above.

Applicants respectfully request that this objection be withdrawn.

Status of the Claims

Claims 1-17 are pending in this application. Claims 1, 6, 8, 9 and 12-17 are independent. By this amendment, claims 6-17 are cancelled without prejudice or disclaimer. Claims 1-5 are amended. No new matter has been added by this amendment.

Rejection under 35 U.S.C. §112

In paragraph three (3) of the Office action, claims 1-17 have been rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the enablement requirement.

Claims 6-17 have been cancelled rendering the rejections directed to these claims moot.

The Office action indicates among other things that “[t]here is no discussions or suggestion of how a polarization filter and an annular aperture would (1) create an effective light source as shown in Figure 1A, 1B, etc. that would have two sections with different polarization, (2) split light into two different polarization state, or (3) control the polarization direction of the light source.”

First of all, it was well known in the art at the time of filing this application (i.e., September, 2003) that the specifically polarized light may be introduced to a specific part on the

effective light source such as disclosed in U.S. Patent Nos. 6,404,484, 5,459,000 and 5,677,755.

It is also known that an aperture stop is used in an optical system as a “guide path” of light coming from a light source. In other words, an aperture stop has been used in an optical system to form an effective light source having a cross section that corresponds to the specific pattern (e.g., a first area and a second area) of the aperture stop. Moreover, a portion of the original specification describes that “[T]he effective light source shapes that control polarization as shown in FIGs. 1, 7 to 9 are implemented as a shape of an aperture stop 174 arranged just after an exit surface of an optical integrator 172...” See the second paragraph of page 35 beginning with line 11 of the original specification. Another portion of the original specification describes Fig. 1B and explains that “[t]he effective light source shape 10B does not deteriorate resolution for a fine pattern by shielding the light of a part 18B as a light shielding part inside σ_{in2} .” See the third full paragraph of page 21 (lines 19-25) of the original specification.

Accordingly, given the teachings in the specification and the well known facts in the art, Applicants believe that a person skilled in the art would understand that an aperture stop can be used to form an effective light source having a specific shape such as shown in Figs. 1A and 1B.

Secondly, Applicants believe that it was also well known in the art that light can be polarized as a different state (e.g., s-polarized state and/or p-polarized state) using a filter so that light with single polarization direction (e.g., vertical direction or longitudinal direction) can be formed from non-polarized light. See, also, the first full paragraph of page 13 (lines 3-23) where Applicants define the S-Polarized light and P-polarized light. Another portion of the specification describes that “it is conceivable to insert a pupil filter into the pupil EE that absorbs or reflects only the p-polarized light...” See lines 11-15 of page 15 of the original specification.

Furthermore, it is well known in the art that the polarization direction of light can be controlled by using, for example, a polarizer such as a wave plate etc. A portion of the specification describes that “the light that mixes the s-polarized light and p-polarized light may be linearly polarized, circularly polarized or non-polarized light...” See, lines 24-27 of the original specification.

Accordingly, given the teachings in the specification and the well known facts in the art, Applicants believe that a skilled artisan would understand that light from a light source can be split into two different polarization state, and/or the polarization direction can be controlled.

In paragraph five (5) of the Office action, claims 1-17 have been rejected under 35 U.S.C. §112, second paragraph, as being indefinite.

Claims 6-17 have been cancelled rendering the rejections directed to these claims moot.

The Office action indicates in particular that the phrase “s-polarized light polarizes in a tangential direction of the annular shape” is unclear.

As Applicants illustrate in Fig. 12 and describe the relevant portion of the original specification, the s-polarized light is polarized in a direction perpendicular to the section including the optical axis of the projection optical system OP, and the p-polarized light is polarized in a direction parallel to the section. Additionally, it is illustrated in Fig. 1A that the annular shape is filled with the s-polarized light.

In view of the above descriptions, Applicants believe that the meaning of the cited phrase by the Examiner (i.e., “s-polarized light polarizes in a tangential direction of the annular shape”) is clear enough for an ordinary skill in the art to understand the invention.

Reconsideration and withdrawal of the rejections of claims 1-5 under 35 U.S.C. §112, first and second paragraph, is respectfully requested.

Rejection under 35 U.S.C. §102

In paragraph seven (7) of the Office action, claims 1-17 have been rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 6,404,482 to Shiraishi (“Shiraishi”).

Claims 6-17 have been cancelled rendering the rejections directed to these claims moot.

Claims 1-5 have been amended as shown above for further clarification.

One of the aspects of the present invention as featured in independent claim 1 as amended is illuminating a mask using an illumination system that forms an effective light source having a first part that mainly includes s-polarized light and a second part that mixes s-polarized light and p-polarized light.

One of the goals of the present invention with the above described feature is directed to mitigate the non-interference problem between the lights having large incident angles upon the object to be exposed. A high-NA projection optical system used to resolve a fine pattern is known to cause the non-interference problem.

Shiraishi discloses a projection exposure method/apparatus in which a coherence reducing member is used to control the polarization state of the illuminated light. The Office action cites FB1 and FB2 of Fig. 7 stating that the illumination system utilizes a first and second regions with two different polarization states (page 5 of the Office action). Applicants note that Fig. 7 of Shiraishi discloses an embodiment (i.e., embodiment 1-7) in which p-polarized light and s-polarized light are illuminated before PCM.

Shirashi, however, fails to show or suggest an exposure method using an effective light source as specifically recited in claim 1 as amended, i.e., illuminating a mask using an illumination system that forms an effective light source having a first part that mainly includes s-polarized light and a second part that mixes s-polarized light and p-polarized light.

Accordingly, claim 1 is believed neither anticipated by nor rendered obvious in view of Shirashi for at least the reasons discussed above.

Reconsideration and withdrawal of the rejection of claim 1 under 35 U.S.C. §102(b) is respectfully requested.

Applicants have not individually addressed the rejections of the dependent claims because Applicants submit that the independent claims from which they respectively depend are in condition for allowance as set forth above. Applicants however reserve the right to address such rejections of the dependent claims should such be necessary.

Applicants believe that the application with amended claims is in condition for allowance and such action is respectfully requested.

AUTHORIZATION

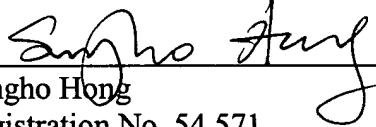
No petitions or additional fees are believed due for this amendment and/or any accompanying submissions. However, to the extent that any additional fees and/or petition is required, including a petition for extension of time, Applicants hereby petition the Commissioner to grant such petition, and hereby authorizes the Commissioner to charge any additional fees, including any fees which may be required for such petition, or credit any overpayment to Deposit Account No. 13-4500 (Order No. 1232-5161). A DUPLICATE COPY OF THIS SHEET IS ENCLOSED.

An early and favorable examination on the merits is respectfully requested.

Respectfully submitted,
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Dated: April 8, 2005

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